Contents

Preface v
Sponsors and Committees viii

FUNDAMENTALS

1. M–H systems: constituent aspects, thermodynamics and kinetics

1.1. Coherent M–H systems

Phase diagram and density modes of deuterium in $NbO_{0.02}$ 1
N. Lipkowitsch, H. Metzger and J. Peisl (Munich, F.R.G.)

1.2. M–H systems and metallic hydrogen

From metal hydrides to the metal–hydrogen system 8
Y. Fukai (Tokyo, Japan)

Two-dimensional metallic hydrogen lattice in potassium–hydrogen–graphite ternary systems 20
T. Enoki, K. Nakazawa, K. Suzuki, S. Miyajima, T. Chiba, Y. Iye (Tokyo, Japan), H. Yamamoto and H. Inokuchi (Okazaki, Japan)

1.3. Phase diagrams

Thermal stability and phase studies of crystalline Zr_2Pd hydrides 29
J. S. Cantrell (Oxford, OH, U.S.A.) and R. C. Bowman, Jr., (Azusa, CA, U.S.A.)

1.4. Novel M–H systems

Metallic properties in the series $K_2Pd(II)H_4$, $Na_2Pd(0)H_2$ and $Li_2Pd(0)H_2$ correlated with the stabilization of a formally zero-valent palladium–hydrogen complex. . . . 36
K. Kadir, M. Kritikos, D Noréus (Stockholm, Sweden) and A. F. Andresen (Kjeller, Norway)

1.5. Hydrogen solubility and kinetics

Calorimetric enthalpies of absorption and desorption of protium and deuterium by palladium. 42
T. B. Flanagan, W. Luo and J. D. Clewley (Burlington, VT, U.S.A.)

Hydrogen solubility in palladium–ytterbium solid solution alloys 56
F. L. Chen, M. Furukawa and Y. Sakamoto (Nagasaki, Japan)

Absorption of hydrogen by vanadium-rich V–Ti-based alloys 64
A. Kagawa, E. Ono, T. Kusakabe and Y. Sakamoto (Nagasaki, Japan)

Hydrogen absorption–desorption properties of UCo 71
T. Yamamoto, H. Kayano, S. Sinaga, F. Ono, S. Tanaka and M. Yamawaki (Ibaraki, Japan)

Influence of magnetic fields on the equilibrium hydrogen pressures of ferromagnetic hydrides 79
I. Yamamoto, M. Yamaguchi (Yokohama, Japan), T. Goto (Tokyo, Japan) and S. Miura (Sendai, Japan)

Effect of interstitial oxygen on hydrogen solubility in titanium, zirconium and hafnium. 85
S. Yamanaka, H. Ogawa and M. Miyake (Osaka, Japan)

Studies on metal–hydrogen systems (VD_x, NbD_x, $LaNi_5H_x$) using secondary ion mass spectrometry 95
H. Züchner, P. Kock, T. Brüning, T. Rauf and R. Dobrileit (Münster, F.R.G.)

Decomposition kinetics of palladium nickel hydride 107
Z. Gavra, J. R. Johnson and J. J. Reilly (Upton, NY, U.S.A.)

The kinetics of the hydriding of uranium metal. 116
G. L. Powell, W. L. Harper and J. R. Kirkpatrick (Oak Ridge, TN, U.S.A.)

The linear solution for hydriding of uranium 124
J. R. Kirkpatrick (Oak Ridge, TN, U.S.A.) and J. B. Condon (Harriman, TN, U.S.A.)

Solubility of hydrogen in CsCl-type Group Ib–erbium alloys XEr (X = Cu, Ag, Au) 136
S. Philipp, P. C. Schmidt and A. Weiss (Darmstadt, F.R.G.)

Hydridation of $Re_2Fe_{14}B$ compounds (Re = Nd, Ce, Y, Gd) 144
M. El Hammioui and N. Gerard (Dijon, France)

Formation of metal hydride powders and metal–hydrogen amorphous powders by mechanochemical reaction 153
K. Tokumitsu (Tokyo, Japan)

Some pressure–composition and electrical resistivity–composition relationships of the Pd–Sc–H system 160
R.-A. McNicholl and F. A. Lewis (Belfast, U.K.)

2. Crystal structures and lattice dynamics

2.1. Crystal structures

Neutron diffraction studies of domain growth associated with the 50 K anomaly in Pd–D 169
D. K. Ross, M. W. McKergow and D. G. Witchell (Birmingham, U.K.) and J. K. Kjems (Roskilde, Denmark)

Effect of hydrogen absorption on the structural properties of the hyperstoichiometric alloys $Zr(Mn_{0.72}Fe_{0.28})_{2+x}$ 183
G. Triantafillidis (Thessaloniki, Greece), L. Pontonnier, D. Fruchart, P. Wolfers and J. L. Soubeyroux (Grenoble, France)

Structural and magnetic behavior of $LuFe_2H_x$ 191
L. Pontonnier, D. Fruchart, J. L. Soubeyroux (Grenoble, France), G. Triantafillidis (Thessaloniki, Greece) and Y. Berthier (St. Martin d'Hères, France)

Structure of $Y_{0.95}Ni_2$ and its hydride 198
A. Percheron-Guégan, V. Paul-Boncour, M. Latroche, J. C. Achard (Meudon, France) and F. Bouree-Vigneron (Gif sur Yvette, France)

Neutron diffraction studies of deuterated Ti_3P. 206
P.-J. Ahlzeén, Y. Andersson, S. Rundqvist and R. Tellgren (Uppsala, Sweden)

Crystallographic studies of compounds from the $LiH + BeH_2$ system. 213
J. S. Cantrell, T. A. Beiter (Oxford, OH, U.S.A.), P. C. Souers and P. Barry (Livermore, CA, U.S.A.)

Relation between equilibrium hydrogen pressure and lattice parameters in pseudobinary Zr–Mn alloy systems 220
S. Fujitani, I. Yonezu, T. Saito, N. Furukawa (Osaka, Japan), E. Akiba, H. Hayakawa and S. Ono (Ibaraki, Japan)

2.2. Lattice dynamics

Lattice dynamics of non-stoichiometric cerium deuteride 231
P. Vorderwisch, S. Hautecler and T. Lesmann (Berlin, F.R.G.)

3. Structural and order–disorder transformations

Hydrogen ordering in metal–hydrogen systems 237
O. Blaschko (Wien, Austria)

Hydrogen-induced ordering in palladium-rich Pd–Mn alloys. 246
K. Baba, Y. Niki, Y. Sakamoto (Nagasaki, Japan) and T. B. Flanagan (Burlington, VT, U.S.A.)

Anelastic relaxation due to hydrogen and deuterium in disordered and ordered Pd_3Mn. 254
B. Sobha, B. Coluzzi, F. M. Mazzolai (Perugia, Italy), T. B. Flanagan (Burlington, VT, U.S.A.) and Y. Sakamoto (Nagasaki, Japan)

The diffusion of hydrogen in disordered and ordered Pd_3MN as studied using the Gorsky relaxation 262
B. Sobha, B. Coluzzi, C. Costa, F. M. Mazzolai (Perugia, Italy), T. B. Flanagan (Burlington, VT, U.S.A.) and Y. Sakamoto (Nagasaki, Japan)

The magnetic and structural ordering in the GdH_{2+x} system. 271
P. Vajda, J. N. Daou and J. P. Burger (Orsay, France)

4. Characteristics of crystal sites for hydrogen

Hydrogen site distribution in the alloy system $Nb_{100-x}V_xH_y$ studied by neutron vibrational spectroscopy. 281
R. Hempelmann, D. Richter (Jülich, F.R.G.), J. J. Rush and J. M. Rowe (Gaithersburg, MA, U.S.A.)

Properties of rare earth dihydrides as reflected in the magnetic behavior of TmH_2, a van Vleck compound 293
D. Shaltiel (Jerusalem, Israel), H. Winter, E. Dormann (Bayreuth, F.R.G.), J. P. Burger, J. N. Daou, P. Vajda (Orsay, France) and A. Grayevsky (Jerusalem, Israel)

Kinetic energy of hydrogen in β-V_2H studied by neutron Compton scattering . . . 301
R. Hempelmann, D. Richter (Jülich, F.R.G.) and D. L. Price (Argonne, IL, U.S.A.)

An inelastic neutron scattering investigation of hydrogen sites in $Y_5Si_3H_x$ ceramics 307
S. M. Bennington (Didcot, U.K.), I. J. McColm (Bradford, U.K.) and D. K. Ross (Birmingham, U.K.)

Localized modes of hydrogen and deuterium in $NiTiH_x$ and $NiTiD_x$ 319
U. Stuhr, R. Schmidt, H. Wipf (Darmstadt, F.R.G.), G. Herget, M. Müllner, S. Mittelbach, W. Assmus (Frankfurt, F.R.G.) and H.-J. Lauter (Grenoble, France)

Uptake and release of hydrogen in palladium by weakly bound sites 326
P. M. Richards, B. D. Kay and W. R. Wampler (Albuquerque, NM, U.S.A.)

Mössbauer study of hydrides and deuterides of iron and cobalt. 333
G. Schneider, M. Baier, R. Wordel, F. E. Wagner (Garching, F.R.G.), V. E. Antonov, E. G. Ponyatovsky (Chernogolovka, U.S.S.R.), Yu. Kopilovskii and E. Makarov (Moscow, U.S.S.R.)

^{57}Fe Mössbauer study of the hydrides of Ni–Cu alloys 343
B. Zhang, H. J. Bauer (Munich, F.R.G.), M. Baier, F. E. Wagner (Garching, F.R.G.), V. E. Antonov and T. E. Antonova (Chernogolovka, U.S.S.R.)

^{197}Au Mössbauer study of the hydrides of Ni–Au alloys 351
B. Zhang, H. J. Bauer (Munich, F.R.G.), M. Baier, F. E. Wagner (Garching, F.R.G.), V. E. Antonov and T. E. Antonova (Chernogolovka, U.S.S.R.)

Mössbauer study of the hydrides of Nb_3Me with A15 structure 358
M. Baier, R. Wordel, F. E. Wagner (Garching, F.R.G.), T. E. Antonova and V. E. Antonov (Chernogolovka, U.S.S.R.)

Proton nuclear magnetic resonance study of crystal field levels in praseodymium hydrides 366
M. Belhoul, R. J. Schoenberger, D. R. Torgeson and R. G. Barnes (Ames, IA, U.S.A.)

Frequency-dependent proton spin relaxation in Zr_2PdH_x 373
D. B. Baker, E.-K. Jeong, M. S. Conradi, R. E. Norberg (St. Louis, MI, U.S.A.) and R. C. Bowman, Jr., (Azusa, CA, U.S.A.)

Novel measurements of nuclear spin cross-relaxation in metal hydrides 379
D. B. Baker, M. S. Conradi, R. E. Norberg (St. Louis, MI, U.S.A.), D. R. Torgeson and R. G. Barnes (Ames, IA, U.S.A.)

5. Electronic structure, superconductors and magnetic properties

5.1. Electronic structures

Energetics and electronic structure of hydrogenated clusters 387
P. Jena, B. K. Rao and S. N. Khanna (Richmond, VA, U.S.A.)

Multiatom interactions between hydrogen atoms near a metallic surface 395
L. Stauffer (Mulhouse, France) and H. Dreyssé (Vandoeuvre-les-Nancy, France)

Calculations of the total energy, electron–phonon interaction and Stoner parameter in the 5d transition metal hydrides 401
D. A. Papaconstantopoulos, J. P. Skroch (Washington, DC, U.S.A.) and G. D. Drew (Landover, MD, U.S.A.)

Magnetic resonance determination of the electronic density of states and the metal–non-metal transition in the LaH_2–LaH_3 system 411
R. G. Barnes, C.-T. Chang, M. Belhoul, D. R. Torgeson, R. J. Schoenberger, B. J. Beaudry (Ames, IA, U.S.A.) and E. F. W. Seymour (Coventry, U.K.)

5.2. Hydrogen in superconducting oxides

Hydrogen in YBaCuO films 419
J. Erxmeyer, G. Dortmann, J. Steiger, O. Boebel and A. Weidinger (Berlin, F.R.G.)

Static and dynamic dilatation of the high-T_c superconductor $EuBa_2Cu_3O_{7-\delta}H_x$ 425
J. N. Daou, J. P. Burger and P. Vajda (Paris, France)

Preparation and properties of compounds of the complex metal oxides Y_2BaMO_6 (M = Cu, Zn) with added hydrogen 433
J. R. Johnson, J. J. Reilly, Z. Gavra and Z. Q. Yang (Upton, NY, U.S.A.)

5.3. Magnetic properties

Magnetic excitations in Tm–H observed using inelastic neutron scattering 440
S. M. Bennington, R. Osborn (Didcot, U.K.), D. K. Ross and M. J. Benham (Birmingham, U.K.)

On unstable magnetic ordering in Ce 3d compounds and their hydrides 451
G. Wisesinger, M. Forsthuber, F. Lehner, G. Hilscher (Vienna, Austria), A. Fischer, L. Schlapbach (Fribourg, Switzerland) and G. Wortmann (Paderborn, F.R.G.)

Magnetic properties of $Ca_{2-x}Eu_xRuH_6$ studied by electron paramagnetic resonance 459
R. C. Bowman, Jr., (Azusa, CA, U.S.A.) and R. O. Moyer, Jr. (Hartford, CT, U.S.A.)

Contents

6. Hydrogen pairing in metals

6.1. Hydrogen pairing in metals and transition metal complexes

Preface to Section 6.1 xxi

Would hydrogen pairing at high temperatures account for nuclear magnetic resonance relaxation anomalies in metal hydrides? 467
R. M. Cotts (Ithaca, NY, U.S.A.)

Chemical bonding of hydrogen molecules to transition metal complexes. 475
G. J. Kubas (Los Alamos, NM, U.S.A.)

Theory of hydrogen pairing in metals 485
S. E. Weber, F. Liu, S. N. Khanna, B. K. Rao and P. Jena (Richmond, VA, U.S.A.)

6.2. Hydrogen pairing and anomalous hydrogen dynamics in rare earth metals

Anomalous hydrogen dynamics in rare earth metals. 496
N. F. Berk, J. J. Rush, T. J. Udovic (Gaithersburg, MD, U.S.A.) and I. S. Anderson (Villigen, Switzerland)

NMR studies of localized interstitial hydrogen motion in the h.c.p. metals Sc, Y and Lu 509
R. Barnes (Ames, IA, U.S.A.)

The internal friction of hydrogen in scandium. 522
P. Vajda, J. N. Daou (Orsay, France), P. Moser and P. Rémy (Grenoble, France)

7. Hydrogen diffusion, hydrogen permeability and muon motions

7.1. Theory

Quantum transition state theory and the diffusion of hydrogen in metals 529
M. J. Gillan (Keele, U.K.)

Diffusion of hydrogen in transition metals 538
H. R. Schober (Jülich, F.R.G.) and A. M. Stoneham (Harwell, U.K.)

Theory of hydrogen hopping dynamics including hydrogen–lattice correlations . . . 548
H. Teichler (Göttingen, F.R.G.)

Quantum diffusion in transition metals. 557
P. Vargas, L. Miranda, L. Rodriguez, M. Lagos and J. Rogan (Santiago, Chile)

Nuclear quadrupolar relaxation due to hydrogen diffusion in metal–hydrogen systems 572
S. W. Kelly, C. A. Sholl (Armidale, N.S.W., Australia) and E. F. W. Seymour (Coventry, U.K.)

Nuclear magnetic dipolar relaxation in disordered metal–hydrogen systems. 579
N. Adnani and J. M. Titman (Sheffield, U.K.)

Elsevier Sequoia, Lausanne

7.2. Measurements with single crystals

Quasi-elastic neutron scattering studies of collective and correlated tracer diffusion in the systems α'-NbD_x and α'-NbH_x 585
J. C. Cook (Grenoble, France), D. Richter, R. Hempelmann (Jülich, F.R.G.), D. K. Ross (Birmingham, U.K.) and H. Züchner (Münster, F.R.G.)

Study of the hydrogen jump geometry in an α-$LaNi_5H_x$ single crystal using quasi-elastic neutron scattering 595
D. Richter, R. Hempelmann and C. Schönfeld (Jülich, F.R.G.)

NMR studies of diffusion anisotropy in metal hydride single crystals 603
H. C. Hoke, H. E. Schone (Williamsburg, VA, U.S.A.), C. A. Sholl, S. P. Usher (Armidale, N.S.W., Australia), R. G. Barnes, D. R. Torgeson (Ames, IA, U.S.A.), R, Hempelmann (Jülich, F.R.G.) and G. A. Styles (Coventry, U.K.)

Electrochemical measurements of hydrogen diffusion in the intermetallic compound $LaNi_5$ 611
H. Züchner, T. Rauf (Münster, F.R.G.) and R. Hempelmann (Jülich, F.R.G.)

7.3. Measurements on polycrystals — NMR techniques

Nuclear magnetic resonance study of hydrogen mobility in Zr_3PD_{3-x} 618
M. Buszko, J. Tegenfeldt, P.-J. Ahlzén and Y. Andersson (Uppsala, Sweden)

Hydrogen diffusion in $Nb_{1-y}V_y$ alloys. 624
A. F. McDowell, P. E. Mauger and R. M. Cotts (Ithaca, NY, U.S.A.)

Nuclear magnetic resonance studies of hydrogen and deuterium in tantalum. . . . 631
M. Hampele, G. Majer, R. Messer and A. Seeger (Stuttgart, F.R.G.)

Comparison of hydrogen diffusion in Ti_2PdH_x with the behavior for Ti_2CuH_x and Zr_2PdH_x. 643
R.C. Bowman, Jr., (Azusa, CA, U.S.A.), A. Attalla, G. C. Abell (Miamisburg, OH, U.S.A.), J. S. Cantrell (Oxford, OH, U.S.A.) and A. J. Maeland (Meriden, CT, U.S.A.)

Nuclear magnetic resonance survey of hydrogen motion and electronic structure in α-phase (Nb–Mo)–H alloys 649
R. Ibanez-Meier, D. R. Torgeson and R. G. Barnes (Ames, IA, U.S.A.)

7.4. Measurements on general systems with various techniques

Diffusion of hydrogen isotopes as a probe to study the atomic microstructure of metals. 658
M. Hirscher and H. Kronmüller (Stuttgart, F.R.G.)

Influence of the microstructure on hydrogen diffusion in Fe–Zr alloys 671
C. U. Maier and H. Kronmüller (Stuttgart, F.R.G.)

Hydrogen diffusion in f.c.c. TiH_x. 678
U. Stuhr, H. Wipf (Darmstadt, F.R.G.) and B. Frick (Grenoble, France)

Low temperature tunnelling and quantum diffusion of hydrogen in $Nb(NH)_x$ 685
D. Steinbinder, H. Wipf (Darmstadt, F.R.G.), A.-J. Dianoux, A. Margerl, D. Richter (Grenoble, France), K. Neumaier (Garching, F.R.G.) and R. Hempelmann (Jülich, F.R.G.)

The diffusion of hydrogen in the A-15 compound Ti_3Ir 693
D. Beisenherz, D. Guthardt and H. Wipf (Darmstadt, F.R.G.)

Electrical resistance studies of hydrogen diffusion in niobium: an old problem revisited 699
E. A. Clark and H. K. Birnbaum (Urbana, IL, U.S.A.)

Hydrogen in niobium under pressure 709
A. Pusch, W. Fenzl and J. Peisl (Munich, F.R.G.)

7.5. Permeation measurements

Permeation of hydrogen through nickel foils: surface reaction rates at low temperatures 718
A. K. Altunoglu, D. A. Blackburn, N. St. J. Braithwaite (Nottingham, U.K.) and D. M. Grant (Oxford, U.K.)

Hydrogen permeation characteristics of palladium-plated V–Ni alloy membranes 727
M. Amano, M. Komaki and C. Nishimura (Tokyo, Japan)

Effect of thin copper and palladium films on hydrogen permeation through iron 732
P. L. Andrew and A. A. Haasz (North York, Ont., Canada)

Hydrogen permeation and diffusion in Fe–Ti alloys 740
W. M. Shu, Y. Hayashi and A. Tahara (Fukuoka, Japan)

Solubility and diffusivity of hydrogen in palladium and $Pd_{77}Ag_{23}$ containing lattice defects 747
R. V. Bucur, N. O. Ersson (Uppsala, Sweden) and X. Q. Tong (Belfast, U.K.)

7.6. Muon motions in metals and M–H systems

Influence of superconductivity on quantum diffusion of the positive muon in aluminium 759
T. Pfiz, R. Kadono, R. F. Kiefl, S. R. Kreitzman, Q. Li, T. M. Riseman, H. Zhou (Vancouver, BC, Canada), S. W. Harris, O. Hartmann, E. Karlsson, R. Wäppling (Uppsala, Sweden), R. Hempelmann, D. Richter (Jülich, F.R.G.), T. O. Niinikoski (Geneva, Switzerland), L. P. Le, G. M. Luke, B. Sternlieb (New York, NY, U.S.A.) and E. J. Ansaldo (Saskatoon, Sask., Canada)

Transverse field depolarization rates for muons in metals 762
L. M. Cameron and C. A. Sholl (Armidale, NSW, Australia)

Muon spin rotation in an Ni–Ti metallic glass hydride 770
R. L. Havill, J. M. Titman and N. Cowlam (Sheffield, U.K.)

8. Hydrogen in thin metal layers and superlattices

Absorption of hydrogen in superlattices studied by the $^{15}N(^1H, \alpha\gamma)^{12}C$ reaction 776
B. Hjörvarsson (Uppsala, Sweden)

Hydrogenated Fe–Ti superlattices studied by hydrogen depth profiling, Mössbauer spectroscopy and X-ray diffraction 784
J. Rydén, B. Hjörvarsson, T. Ericsson, E. Karlsson (Uppsala, Sweden), A. Chamberod and B. Rodmacq (Grenoble, France)

Hydrogen in Nb/Hf/Nb and Nb/Ti/Nb thin films 792
J. Steiger, O. Boebel, S. Blässer and A. Weidinger (Berlin, F.R.G.)

Thermodynamic properties and cyclic hydriding–dehydriding stability of $LaNi_5$ thin films 799
H. Uchida, T. Kojima, H. Hashimoto and A. Denda (Kanagawa, Japan)

Hydrogen in magnesium alloys and magnesium interfaces: preparation, electronic properties and interdiffusion 808
A. Fischer, H. Köstler and L. Schlapbach (Fribourg, Switzerland)

Electrochemical isotherm measurements on the Pd–H and PdAg–H systems 816
H. Züchner and T. Rauf (Münster, F.R.G.)

9. Surface reactions affecting hydrogen absorption

Effect of O_2, N_2 and CO impurities on the H_2 absorption rate of Ti films at 300 K 824
N. Hosoda, H. H. Uchida and E. Fromm (Stuttgart, F.R.G.)

Reaction kinetics of H_2 absorption by lanthanum with and without surface oxide layers 832
H. Uchida, Y. Ohtani, T. Kawahata, H. Minamitani, N. Ninomiya (Kanagawa, Japan), E. Fromm, N. Hosoda and H. H. Uchida (Stuttgart, F.R.G.)

Effect of surface contaminations on the hydriding behaviour of $LaNi_5$ 841
Y. Ohtani, S. Hashimoto and H. Uchida (Kanagawa, Japan)

Colouration of oxidized niobium surfaces by electrochemical hydrogen charging 851
Y. Hayashi, T. Miyakoshi and M. Masuda (Fukuoka, Japan)

Hydrogen–surface interactions on clean and on oxidized polycrystalline aluminium and Al 5083 alloy 859
N. Shamir, M. H. Mintz and U. Atzmony (Beer Sheva, Israel)

Surface effects in the reaction of H and D with Pd — macroscopic manifestations 867
G. L. Powell, J. R. Kirkpatrick (Oak Ridge, TN, U.S.A.) and J. W. Conant (Los Alamos, NM, U.S.A.)

The effects of etching with HCl on the hydrogen sorption properties of Mg_2Ni . . . 873
H.-Y. Zhu, C.-P. Chen, Y.-Q. Lei, J. Wu and Q.-D. Wang (Zhejiang, China)

10. Amorphous M–H systems

Hydrogen in amorphous Ni–Zr and Ni–Ti alloys 880
R. Kirchheim, W. Kieninger, X. Y. Huang (Stuttgart, F.R.G.), S. M. Filipek (Warsaw, Poland), J. Rush and T. Udovic (Washington, DC, U.S.A.)

Solubility and diffusivity of hydrogen in amorphous $Pd_{73.2}X_{8.6}Si_{18}$ (X ≡ Ag, Cu, Cr, Fe, Ni) alloys 890
O. Yoshinari (Nagoya, Japan) and R. Kirchheim (Stuttgart, F.R.G.)

Comparison of the hydrogen absorption process in as-quenched and relaxed $Zr_{50}Ni_{50}$ glassy ribbons 899
I. Bakonyi, I. Nagy, E. Tóth-Kádár, M. Hossó, K. Tompa, G. Konczos and A. Lovas (Budapest, Hungary)

Hydrogen internal friction peak and thermal desorption spectrum in amorphous $Cu_{50}Zr_{50}$ 908
H. Mizubayashi, T. Naruse and S. Okuda (Ibaraki, Japan)

Neutron quasi-elastic scattering from hydrogen in zirconium–nickel metallic glasses 915
M. S. Wright, J. M. Titman and R. L. Havill (Sheffield, U.K.)

Hydrogen diffusion in amorphous Ni–Zr 922
J. O. Ström-Olsen, Y. Zhao, D. H. Ryan, Y. Huai and R. W. Cochrane (Montreal, Que., Canada)

Thermal desorption spectra of hydrogen from glassy $Pd_{35}Zr_{65}$ and crystalline $PdZr_2$ 928
K. Tanaka, T. Araki, T. Abe and O. Yoshinari (Nagoya, Japan)

11. Miscellaneous

The Czochralski hydrogen compressor in copper crystal growth 936
H. Wenzl, A. Fattah, G. Hanke and W. Uelhoff (Jülich, F.R.G.)

Contents

TECHNICAL APPLICATIONS

1. Overview

Metal hydride practical applications 943
F. E. Lynch (Littleton, CO, U.S.A.)

2. Hydrogen storage alloys—intrinsic properties and behaviour

Design of a new reactor system for the kinetic study of metal hydrides under isothermal conditions 959
S. Suda, X.-L. Wang and Y. Komazaki (Tokyo, Japan)

Reaction kinetics of metal hydrides under quasi-isothermal conditions 969
X.-L. Wang and S. Suda (Tokyo, Japan)

Surface processes of H_2 in the initial activation of $LaNi_5$ 983
H. Uchida, Y. Ohtani, M. Ozawa, T. Kawahata and T. Suzuki (Kanagawa, Japan)

Investigation of $LaNi_5$ after prolonged cycling 997
Y. Josephy, E. Bershadsky and M. Ron (Haifa, Israel)

The effect of the partial replacement of nickel in $LaNi_5$ hydride with iron, cobalt, and copper on absorption and desorption kinetics 1009
A. Zarynow, A. J. Goudy, R. G. Schweibenz and K. R. Clay (West Chester, PA, U.S.A.)

Effects of prior hydrogen dissolution and hydriding on hydrogen solubility in $LaNi_5$ 1018
H. Uchida, A. Hisano, K. Terao, N. Sato and A. Nagashima (Kanagawa, Japan)

Control of hydrogen equilibrium pressure for C14-type Laves phase alloys 1028
Y. Moriwaki, T. Gamo and T. Iwaki (Osaka, Japan)

Investigation of kinetics and structural changes in $TiFe_{0.9}Ni_{0.2}$ after prolonged cycling 1036
E. Bershadsky, Y. Josephy and M. Ron (Haifa, Israel)

Characteristics of hydrogen absorption and reactivation of $TiMn_{1.25}Cr_{0.25}$ alloy 1044
C.-M. Hong, D.-G. Han and Q.-Z. Lin (Beijing, China)

Hydriding kinetics of $TiFe_{0.8}Co_{0.8}$ compounds 1052
M. Boulghallat and N. Gerard (Dijon, France)

The intermetallics V–20Ti and FeTi: a transmission electron microscopy study of hydriding reactions and thermodynamic stability 1058
M. Otte and T. Schober (Jülich, F.R.G.)

Improved hydrogen storage by Mg and Mg–Ni modified by organic compounds 1064
H. Imamura (Ube, Japan)

Mg–Zn–Ni hydrogen storage alloys 1071
E. Akiba, H. Hayakawa, Y. Ishido and K. Nomura (Ibaraki, Japan)

Catalytic effect of nickel, iron and palladium on hydriding titanium and storage materials 1076
H. H. Uchida, H.-G. Wulz and E. Fromm (Stuttgart, F.R.G.)

The effects of pretreatments on the catalytic activities of hydrogen storage intermetallics 1084
L.-Z. Wang, Y.-Q. Lei, J. Wu, Q.-D. Wang, F.-Q. Ma and B.-L. Liu (Hangzhou Zhejiang, China)

3. Hydrogen storage alloys—applications in devices

Development of a double-stage heat pump: experimental and analytical surveys 1092
S. Suda, Y. Komazaki, H. Narasaki and M. Uchida (Tokyo, Japan)

Magnesium hydride for thermal energy storage in a small-scale solar–thermal power station. 1111
M. Wierse, R. Werner and M. Groll (Stuttgart, F.R.G.)

Two-stage metal hydride heat transformer laboratory model: results of reaction bed tests 1122
R. Werner and M. Groll (Stuttgart, F.R.G.)

The effective thermal conductivity of a metal hydride bed packed in a multiple-waved sheet metal structure 1130
S. Suda and Y. Komazaki (Tokyo, Japan)

The thermal conductivity of porous metal matrix hydride compacts 1138
M. Ron, E. Bershadsky and Y. Josephy (Haifa, Israel)

Effective thermal conductivity in hydride packed beds
I. Study of basic mechanisms with help of the Bauer and Schlünder model 1147
M. Pons and P. Dantzer (Orsay, France)

Application of SAES and HWT gas purifiers for the removal of impurities from helium–hydrogen gas mixtures 1157
H. Albrecht, U. Kuhnes and W. Asel (Karlsruhe, F.R.G.)

Some engineering methods for eliminating deformation and expansion damage of hydride storage containers 1168
M. Au, J. Wu and Q.-D. Wang (Hangzhou Zhejiang, China)

4. Metal–hydrogen electrodes—experimental developments

Rare-earth-based alloy electrodes for a nickel–metal hydride battery 1175
T. Sakai, T. Hazama, H. Miyamura, N. Kuriyama, A. Kato and H. Ishikawa (Osaka, Japan)

Influence of binding materials for shaping alloy electrodes on the performance of a Ni/metal hydride battery 1185
T. Sakai (Osaka, Japan), A. Takagi, K. Kinoshita (Aichi, Japan), N. Kuriyama, H. Miyamura and H. Ishikawa (Osaka, Japan)

Nickel–metal hydride battery using microencapsulated alloys 1194
T. Sakai, A. Yuasa, H. Ishikawa, H. Miyamura and N. Kuriyama (Osaka, Japan)

Characteristics of electrodes using amorphous AB_2 hydrogen storage alloys 1205
H. Miyamura, N. Kuriyama, T. Sakai, K. Oguro, A. Kato, H. Ishikawa and T. Iwasaki (Osaka, Japan)

Electrode characteristics of C15-type Laves phase alloys 1211
Y. Moriwaki, T. Gamo, H. Seri and T. Iwaki (Osaka, Japan)

Effects of partial substitution and anodic oxidation treatment of Zr–V–Ni alloys on electrochemical properties 1219
S. Wakao, H. Sawa (Kanagawa, Japan) and J. Furukawa (Fukushima, Japan)

Cyclic behaviour of metal hydride electrodes and the cell characteristics of nickel–metal hydride batteries 1227
M. Kanda, M. Yamamoto, K. Kanno, Y. Satoh, H. Hayashida and M. Suzuki (Kawasaki, Japan)

A new pressure–composition–temperature curve application: potential of the MH electrode 1236
C. Jordy, A. Percheron-Guegan (Meudon, France), J. Bouet (Marcoussis, France), P. Sanchez, C. Chanson and J. Leonardi (Bordeaux, France)

A rechargeable cell based on amorphous Ni–Zr 1246
D. H. Ryan, F. Dumais, B. Patel, J. Kycia and J. O. Ström-Olsen (Montreal, Que., Canada)

Surface analysis of AB_5-type electrodes 1252
F. Meli and L. Schlapbach (Fribourg, Switzerland)

The relation between discharge capacities and discharge current densities of hydride electrodes 1260
Z.-P. Li, Y.-Q. Lei, C.-P. Chen, J. Wu and Q.-D. Wang (Hangzhou Zhejiang, China)

The cycling behaviour of mischmetal–nickel-based metal hydride electrodes and the effects of copper plating on their performance 1265
Y.-Q. Lei, Z.-P. Li, C.-P. Chen, J. Wu and Q.-D. Wang (Hangzhou Zhejiang, China)

5. Hydrogen use in production of magnetic powders

Hydrogen: its use in the processing of NdFeB-type magnets 1273
I. R. Harris and P. J. McGuiness (Birmingham, U.K.)

Hydrogen absorption/desorption studies on some giant magnetostrictive $REFe_2$ alloys and their powder metallurgical processing by hydrogen decrepitation 1285
D. G. R. Jones, J. S. Abell and I. R. Harris (Birmingham, U.K.)

6. Hydrogen involvement in nuclear reactor problems

Gettering of hydrogen from Zr–2.5wt.%Nb pressure tubes 1297
C. D. Cann, E. E. Sexton, A. A. Bahurmuz, A. J. White, H. R. Balness and G. A. Ledoux (Pinawa, Canada)

Deuterium depth distribution in oxidized Zr–2.5wt.%Nb measured by nuclear reaction analysis 1306
T. Laursen and J. R. Leslie (Kingston, Ont., Canada) and R. L. Tapping (Chalk River, Ont., Canada)

7. Hydrogen isotope separation

Metal hydride compacts for hydrogen isotope separation 1313
L. K. Heung, R. S. Tran and K. J. Stoner (Aiken, SC, U.S.A.)

Selection of a hydride former for the separation of hydrogen isotopes from inert gases 1320
I. A. Fisher (Aiken, SC, U.S.A.)

Hydrogen isotopic exchange in palladium hydride 1331
D. H. W. Carstens and P. D. Encinias (Los Alamos, NM, U.S.A.)

Flow in a metal hydride chromatographic column 1338
G. S. Nichols (Aiken, SC, U.S.A.)

8. Tritide systems

Autocatalytic tritium adsorption in niobium and tantalum at room temperature 1345
T. Schober and N. Iniotakis (Jülich, F.R.G.)

Effects of radiolytic tritium decay on the thermodynamic behaviour of $LaNi_{4.25}Al_{0.75}$ tritides 1352
A. Nobile, Jr., R. T. Walters and W. C. Mosley (Aiken, SC, U.S.A.)

9. High concentrations of deuterium in Pd and other transition metals

Electronic structure and stability of palladium hydrogen (deuterium) systems, $PdH(D)_n$, $1 \leqslant n \leqslant 3$ 1363
A. C. Switendick (Albuquerque, NM, U.S.A.)

Interaction between two neighboring deuterium atoms in palladium 1371
K.-I. Tsuchiya, Y. H. Ohashi, K. Ohashi (Tokyo, Japan) and M. Fukuchi (Kanagawa, Japan)

In situ observation of deuteride formation in palladium foil cathode by an X-ray diffraction method 1381
T. Yamamoto, R. Taniguchi, T. Oka and K. Kawabata (Osaka, Japan)

Miscellaneous

Comments on the magnetic and structural ordering in the GdH_{2+x} system by P. Vadja, J. N. Daou and J. P. Burger 1388
R. R. Arons (Jülich, F.R.G.)

Author Index 1390

Subject Index 1393